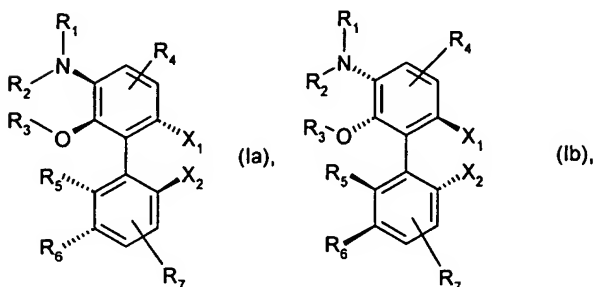


## Amendments in the Claims

1. (Original) A compound of the formula Ia or Ib,



where

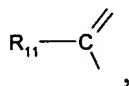
X<sub>1</sub> and X<sub>2</sub> are each, independently of one another, secondary phosphino;

R<sub>1</sub> and R<sub>2</sub> are each, independently of one another, hydrogen, C<sub>1</sub>-C<sub>8</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>6</sub>-C<sub>10</sub>-aryl or C<sub>7</sub>-C<sub>11</sub>-aralkyl, or

R<sub>1</sub> and R<sub>2</sub> together are C<sub>4</sub>-C<sub>8</sub>-alkylene, 3-oxapentyl-1,5-ene, -(CH<sub>2</sub>)<sub>2</sub>-NH-(CH<sub>2</sub>)<sub>2</sub>- or -(CH<sub>2</sub>)<sub>2</sub>-N(C<sub>1</sub>-C<sub>4</sub>alkyl)-(CH<sub>2</sub>)<sub>2</sub>-,

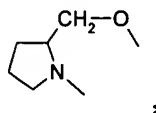
R<sub>3</sub> is hydrogen, C<sub>1</sub>-C<sub>8</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>6</sub>-C<sub>10</sub>-aryl or C<sub>7</sub>-C<sub>11</sub>-aralkyl, or

R<sub>1</sub> is as defined above and R<sub>2</sub> and R<sub>3</sub> together are C<sub>2</sub>-C<sub>8</sub>-alkylidene, C<sub>4</sub>-C<sub>8</sub>-cycloalkylidene, C<sub>1</sub>-C<sub>4</sub>-alkylene, C<sub>2</sub>-C<sub>8</sub>-alk-1,2-enyl, -C(O)- or a group of the formula



or

R<sub>1</sub>R<sub>2</sub>N and R<sub>3</sub>O together are a group of the formula

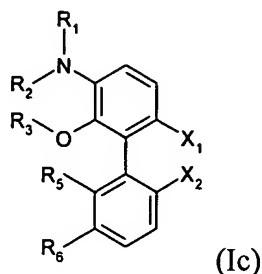


or

$R_1$ ,  $R_3$ , or  $R_1$  and  $R_3$  together are a protective group and  $R_2$  is as defined above,  
 $R_4$  and  $R_7$  are each, independently of one another, hydrogen,  $C_1$ - $C_4$ -alkyl,  $C_1$ - $C_4$ -alkoxy,  
F, Cl or trifluoromethyl,  
 $R_5$  is hydrogen,  $R_4$  or an  $R_3O$ - group, where  $R_3O$ - groups in the two rings can be identical  
or different,  
 $R_6$  is hydrogen,  $R_7$  or an  $R_1R_2N$ - group, where  $R_1R_2N$ - groups in the two rings can be  
identical or different,  
 $R_5$  and  $R_6$  together are trimethylene, tetramethylene or  $-CH=CH-CH=CH-$ ,  
and  
 $R_{11}$  is  $C_1$ - $C_8$ -alkyl,  $C_3$ - $C_8$ -cycloalkyl,  $C_3$ - $C_8$ -cycloalkyl- $C_1$ - $C_4$ -alkyl,  $C_6$ - $C_{10}$ -aryl or  $C_7$ -  
 $C_{11}$ -aralkyl,  
where  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$  and  $R_7$  are unsubstituted or substituted by  $C_1$ - $C_4$ -alkyl,  $C_1$ - $C_4$ -  
alkoxy, OH, F, Cl, Br, trifluoromethyl,  $C_1$ - $C_4$ -hydroxyalkyl,  $-COOH$ ,  $-SO_3H$ ,  $-C(O)O$ - $C_1$ -  
 $C_4$ -alkyl,  
 $-SO_3$ - $C_1$ - $C_4$ -alkyl,  $-C(O)-NH_2$ ,  $-CONHC_1$ - $C_4$ -alkyl,  $-CON(C_1-C_4-alkyl)_2$ ,  $-SO_3-NH_2$ ,  
 $-SO_2-NHC_1$ - $C_4$ -alkyl,  $-SO_3-N(C_1-C_4-alkyl)_2$ ,  $-O_2C-R_8$ ,  $-O_3S-R_8$ ,  $-NH(O)C-R_8$ ,  $-NH-O_3S-$   
 $R_8$ ,  
 $-NH_2$ ,  $-NHR_9$  or  $-NR_9R_{10}$ , where  $R_8$  is hydrogen,  $C_1$ - $C_8$ -alkyl,  $C_3$ - $C_8$ -cycloalkyl,  $C_3$ - $C_8$ -  
cycloalkyl- $C_1$ - $C_4$ -alkyl,  $C_6$ - $C_{10}$ -aryl or  $C_7$ - $C_{11}$ -aralkyl, and  $R_9$  and  $R_{10}$  are each,  
independently of one another,  $C_1$ - $C_4$ -alkyl, phenyl or benzyl or  $R_9$  and  $R_{10}$  together are  
tetramethylene, pentamethylene, 3-oxa-1,5-pentane or  $-(CH_2)_2-N(C_1-C_4-alkyl)-(CH_2)_2-$ .

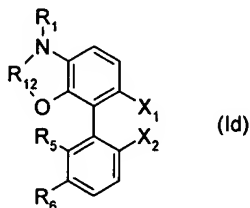
2. (Original) The compound as claimed in claim 1, characterized in that  $X_1$  is a  
 $-P(R)_2$  group and  $X_2$  is a  $-P(R')_2$  group, where  $R$  and  $R'$  are each, independently of one  
another, an  $X_1/X_2$ -forming radical, for example a hydrocarbon radical which has from 1  
to 20 carbon atoms and is unsubstituted or substituted by halogen,  $C_1$ - $C_6$ -alkyl,  $C_1$ - $C_6$ -  
haloalkyl,  $C_1$ - $C_6$ -alkoxy,  $C_1$ - $C_6$ -haloalkoxy,  $-CO_2$ - $C_1$ - $C_6$ -alkyl,  $(C_6H_5)_3Si$  or  $(C_1-C_{12}$ -  
alkyl) $_3Si$ ; or the radicals  $R$  and  $R'$  together are unsubstituted or  $C_1$ - $C_4$ -alkyl- and/or  $C_1$ -  
 $C_4$ -alkoxy-substituted tetramethylene or pentamethylene.

3. (Original) The compound as claimed in claim 1, characterized in that it corresponds to the formula Ic,

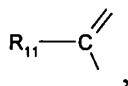


where  $R_1$  is hydrogen or is defined as for  $R_2$ , or  $R_1$ ,  $R_2$  and  $R_3$  are each, independently of one another,  $C_1$ - $C_4$ -alkyl,  $R_5$  is hydrogen or an  $OR_3$  group,  $R_6$  is hydrogen or an  $-NR_1R_2$  group, or  $R_5$  and  $R_6$  together are  $-\text{CH}=\text{CH}-\text{CH}=\text{CH}-$ , and  $X_1$  and  $X_2$  are secondary phosphino.

4. (Original) The compound as claimed in claim 1, characterized in that it corresponds to the formula Id,

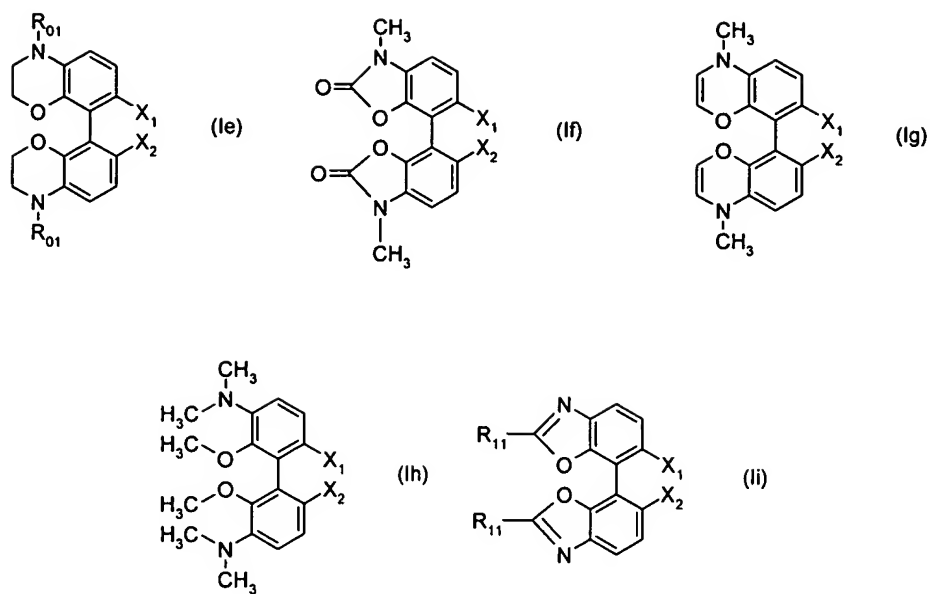


where  $R_1$  is hydrogen or  $C_1$ - $C_4$ -alkyl,  $R_5$  and  $R_6$  are each hydrogen or  $R_5$  and  $R_6$  together are an  $-NR_1-R_{12}-O-$  group,  $X_1$  and  $X_2$  are secondary phosphino and  $R_{12}$  is 1,2-ethylene, 1,2-ethenylene,  $-\text{C}(\text{O})-$  or a group of the formula



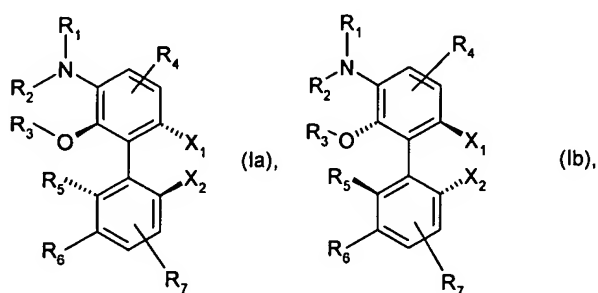
where  $R_{11}$  is branched  $C_3$ - $C_8$ -alkyl,  $C_5$ - $C_6$ -cycloalkyl, phenyl or benzyl.

5. (Original) The compound as claimed in claim 1, characterized in that it corresponds to the formula Ie, If, Ig, Ih or Ii,



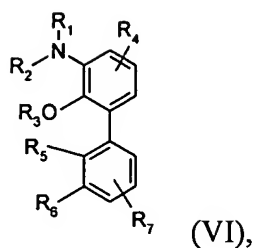
where R<sub>01</sub> is hydrogen, C<sub>1</sub>-C<sub>8</sub>-alkyl, C<sub>5</sub>-C<sub>6</sub>-cycloalkyl, phenyl or benzyl, R<sub>11</sub> is phenyl or t-butyl and X<sub>1</sub> and X<sub>2</sub> are as defined above, including the preferences.

6. (Original) A process for preparing compounds of the formulae Ia and Ib,

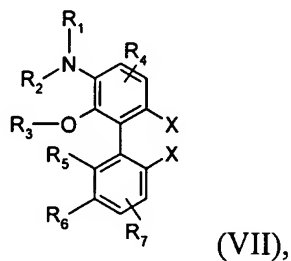


where R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub>, X<sub>1</sub> and X<sub>2</sub> are as defined above, which comprises the steps:

a) halogenation of a compound of the formula VI



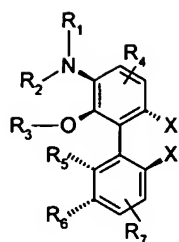
where  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$  and  $R_7$  are as defined above, or  $R_1$  is a protective group which can be split off and  $R_2$  is hydrogen or is as defined above, or  $R_3$  is a protective group which can be split off, or  $R_1$  and  $R_3$  form a protective group which can be split off and  $R_2$  is hydrogen or is as defined above, by means of chlorine, bromine or iodine to form a compound of the formula VII



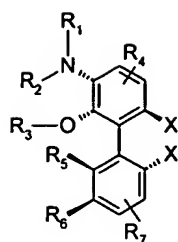
where X is chlorine, bromine or iodine,

b) if appropriate to introduce the radicals  $R_2$  and  $R_3$ , removal of the protective groups to form OH-functional and NH-functional groups and replacement of the H atoms in the OH-functional and NH-functional groups by means of a reagent  $R_2-Y_2$ ,  $R_3-Y_2$  or  $Y_2-R_{13}-Y_2$ , where  $Y_2$  is a leaving group and  $R_{13}$  is 1,2-alkylene or 1,2-cycloalkylene, to produce compounds of the formula VII, and

if appropriate resolution of the racemates of the formula VII to give the enantiomers of the formulae VIIa and VIIb

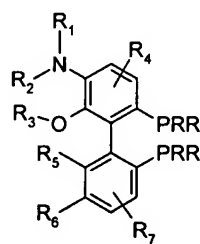


VIIa

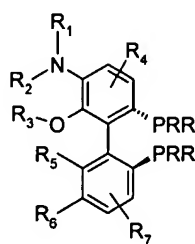


VIIb

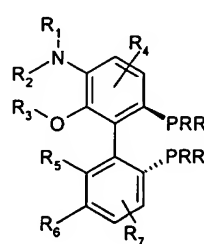
c) metalation of the compounds of the formula VII, VIIa or VIIb, for example by means of a lithium alkyl, and subsequent reaction with a halophosphine of the formula  $X_3\text{-PRR}$  ( $X_3$  is halogen) in the presence of a lithium alkyl to give diphosphines of the formula VIII, Ia or Ib, or with a halophosphine oxide of the formula  $X_3\text{-P(O)RR}$  to give diphosphine oxides of the formula IX, IXa or IXb, or with a phosphonate of the formula  $X_3\text{-P(O)(OR}^\circ)_2$  to give phosphonates of the formula X, Xa or Xb:



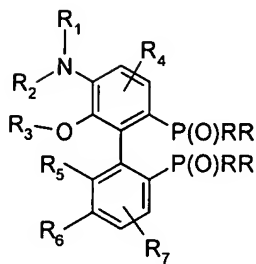
(VIII),



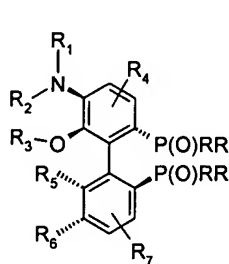
(Ia),



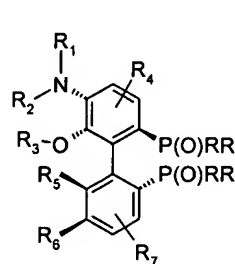
(Ib),



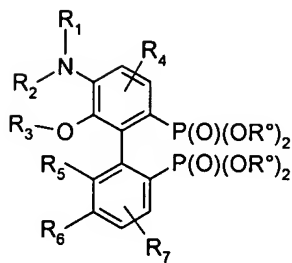
(IX),



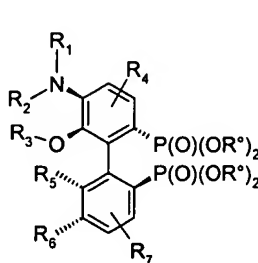
(IXa),



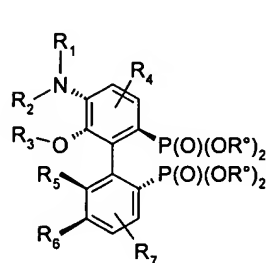
(IXb),



(X),



(Xa),



(Xb),

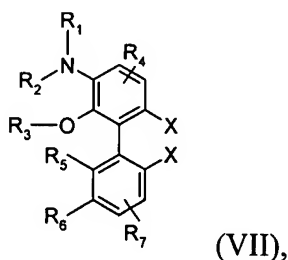
where R is a radical forming  $X_1/X_2$ , for example a hydrocarbon radical having from 1 to 20 carbon atoms and  $R^\circ$  is  $C_1$ - $C_6$ -alkyl or phenyl,

d) if a racemic starting material of the formula VII is used, oxidation of the phosphine groups in compounds of the formula VIII, VIIIa or VIIIb by means of an oxidant to form compounds of the formula IX, IXa or IXb,

e) resolution of the racemates of the formula VIII to give the enantiomers Ia and Ib, or resolution of the racemates of the formula IX to give the enantiomers of the formulae IXa and IXb, or resolution of the racemates of the formula X to give the enantiomers of the formulae Xa and Xb, and reaction of compounds of the formulae Xa and Xb with  $R-Mg-X$  to form phosphine oxides of the formula IXa and IXb, and

f) reduction of the phosphine oxide group in the compounds of the formulae Xa and Xb to produce compounds of the formulae Ia and Ib.

7. (Original) A compound of the formula VII in the form of the racemate, a mixture of diastereomers, a pure diastereomer or an enantiomer in optically enriched or optically pure form,

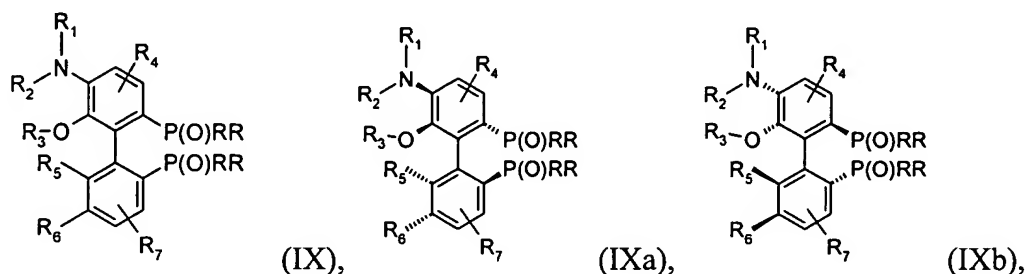


where  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$  and  $R_7$  are as defined in claim 1, or

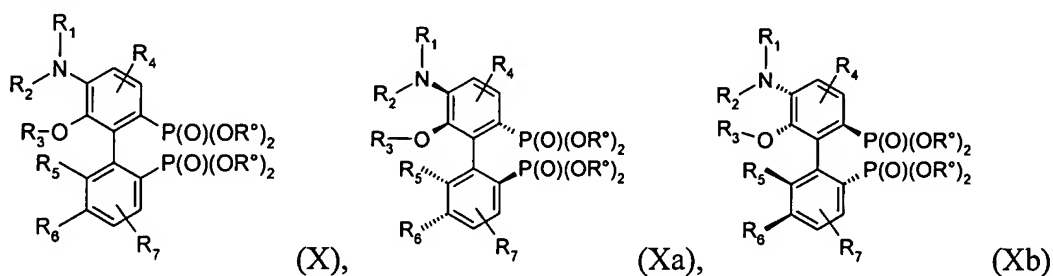
$R_2$  is a protective group which can be split off or  $R_2$  and  $R_3$  together form a protective group which can be split off and  $R_1$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$  and  $R_7$  or  $R_1$ ,  $R_4$ ,  $R_5$ ,  $R_6$  and  $R_7$  are as defined in claim 1, and

$X$  is chlorine, bromine or iodine.

8. (Original) A compound of the formula IX (racemate) or a compound of the formula IXa and/or IXb (mixture of diastereomers, a pure diastereomer or an enantiomer in optically enriched or optically pure form),



or a preproduct of the formula X (racemate) or a compound of the formula Xa and/or Xb (mixture of diastereomers, a pure diastereomer or an enantiomer in optically enriched or optically pure form),

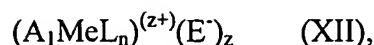


where  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ ,  $R_7$  have the meanings indicated for the compounds of the formulae I and Ia, including the preferences,  $R^\circ$  is  $C_1$ - $C_6$ -alkyl or phenyl and R is an  $X_1/X_2$ -forming radical, for example a hydrocarbon radical having from 1 to 20 carbon atoms.

9. (Original) A complex of a metal selected from the group of the TM8 metals with a compound of the formula Ia or Ib as claimed in claim 1 as ligand.

10. (Currently amended) ~~The metal complex as claimed in claim 9~~ A complex of a metal selected from the group of the TM8 metals with a compound of the formula Ia or Ib as claimed in claim 1 as ligand which corresponds to the general formula XI or XII,





where  $A_1$  is a compound of the formula Ia or Ib as claimed in claim 1;

L represents identical or different monodentate, anionic or nonionic ligands, or two L form identical or different bidentate, anionic or nonionic ligands;

n is 2, 3 or 4 when L is a monodentate ligand or n is 1 or 2 when L is a bidentate ligand;

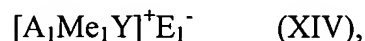
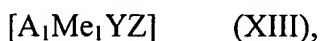
z is 1, 2 or 3;

Me is a metal selected from the group consisting of Rh and Ir; with the metal having the oxidation state 0, 1, 2, 3 or 4;

$E^-$  is the anion of an oxo acid or complex acid; and

the anionic ligands balance the charge of the oxidation stage 1, 2, 3 or 4 of the metal.

11. (Currently amended) ~~The metal complex as claimed in claim 9~~ A complex of a metal selected from the group of the TM8 metals with a compound of the formula Ia or Ib as claimed in claim 1 as ligand which corresponds to the formula XIII or XIV,



where

$A_1$  is a compound of the formula Ia or Ib as claimed in claim 1;

$Me_1$  is rhodium or iridium;

Y represents two olefins or one diene;

Z is Cl, Br or I; and

$E_1^-$  is the anion of an oxo acid or complex acid.

12. (Original) A process for preparing chiral organic compounds by asymmetric addition of hydrogen, boron hydrides or silanes onto a carbon-carbon or carbon-heteroatom multiple bond in prochiral organic compounds, or the asymmetric addition of carbon nucleophiles, alcohols or amines onto allyl compounds in the presence of a

catalyst, characterized in that the addition reaction is carried out in the presence of catalytic amounts of at least one metal complex as claimed in claim 9.

13. (Original) The use of the metal complexes as claimed in claim 9 as homogeneous catalysts for preparing chiral organic compounds by asymmetric addition of hydrogen, boron hydrides or silanes onto a carbon-carbon or carbon-heteroatom multiple bond in prochiral organic compounds, or the asymmetric addition of carbon nucleophiles or amines onto allyl compounds.